CLAIMS

1. An autothermal process for the decomposition of ammonia, which process comprises:

feeding a mixture of ammonia and an oxygen-containing gas into a reaction zone where it is contacted with an ammonia decomposition catalyst at effective conditions to cause the ammonia to decompose into nitrogen and hydrogen by an endothermic reaction, wherein a portion of the hydrogen thus produced is combusted in said reaction zone by an exothermic reaction that produces an effective amount of heat to maintain the ammonia decomposition reaction.

2. The autothermal process of claim 1 wherein the oxygen-containing gas is air.

3. The autothermal process of claim 1 wherein the decomposition catalyst contains at least one metal selected from the groups consisting of IIIA, IVA, VA, VIA, VIIA, VIIIA, IB, and IIB of the Periodic Table of the Elements

4. The autothermal process of claim 3 wherein the decomposition catalyst contains at least one metal selected from the Groups VIA, VIIA, and VIIIA of the Periodic Table of the Elements.

5. The autothermal process of claim 4 wherein the decomposition catalyst contains at least one metal selected from the group consisting of Fe, Ni, Co, Cr, Mn, Pt, Pd, and Ru.

6. The autothermal process of claim 1 wherein the decomposition catalyst is supported on a support selected from monoliths, fiber mats, and refractory particles.

7. The autothermal process of claim 6 wherein the support is comprised of a material selected from the group consisting of carbon and a metal oxide.

8. The autothermal process of claim 7 wherein the support is comprised of a material selected from the group consisting of alumina, silica, silca-alumina, titania, magnesia, and aluminum metasilicates.

9. The autothermal process of claim 8 wherein the support is comprised of alumina in the form of a monolith.

10. The autothermal process of claim 9 wherein the monolith is in the form of a honeycomb structure comprised of a plurality of finely divided gas flow passages extending there-through.

11. The autothermal process of claim 1 wherein the reactor in which ammonia decomposition and hydrogen combustion take place is a thermal integration reactor wherein a hot effluent gas is produced which transfers heat to incoming feed comprised of ammonia and an oxygen-containing gas.

12. A method for operating a hydrogen fuel cell which method comprising:

passing a mixture of ammonia and an oxygen-containing gas to a reaction zone containing an ammonia decomposition catalyst at effective conditions under which said ammonia undergoes decomposition to nitrogen and hydrogen and wherein a first portion of said hydrogen is combusted in said reaction zone to produce an effective amount of heat to maintain the ammonia decomposition reaction;

passing a second portion of hydrogen to said hydrogen fuel cell; and

reacting said hydrogen in said hydrogen fuel cell to produce electric current.

13. The method of claim 12 wherein the oxygen-containing gas is air.

14. The method of claim 12 wherein a third portion of hydrogen is passed to a hydrogen storage tank.

15. The method of claim 12 wherein said wherein the decomposition catalyst contains at least one metal selected from the groups consisting of IIIA, IVA, VA, VIA, VIIA, VIIIA, IB, and IIB of the Periodic Table of the Elements.

16. The method of claim 15 wherein the decomposition catalyst contains at least one metal selected from the group consisting of Fe, Ni, Co, Cr, Mn, Pt, Pd, and Ru.

17. The method of claim 12 wherein said fuel cell is associated with a transportation vehicle by supplying power to said transportation vehicle.

18. The method of claim 12 wherein the reactor in which ammonia decomposition and hydrogen combustion take place is a thermal integration reactor wherein a hot effluent gas is produced which transfers heat to incoming feed comprised of ammonia and an oxygen-containing gas.

19. A method for operating an internal combustion engine transportation vehicle having an ammonia storage vessel and an ammonia decomposition reactor, said method comprising:

passing a mixture of ammonia and air from said ammonia storage vessel into said ammonia decomposition reactor containing an ammonia decomposition catalyst at effective conditions that will cause the ammonia to decompose to nitrogen and hydrogen and wherein a first portion of said hydrogen is combusted in said reaction zone to produce an effective amount of heat to maintain the ammonia decomposition reaction;

passing a second portion of hydrogen, which is a product of said ammonia decomposition reactor as fuel to the internal combustion engine.

20 ~~19~~. The autothermal process of claim 18 wherein the decomposition catalyst contains at least one metal selected from the groups consisting of IIIA, IVA, VA, VIA, VIIA, VIIIA, IB, and IIB of the Periodic Table of the Elements

21 ~~20.~~ The autothermal process of claim 19 wherein the decomposition catalyst contains at least one metal selected from the Groups VIA, VIIA, and VIIIA of the Periodic Table of the Elements.

22 ~~21.~~ The autothermal process of claim 20 wherein the decomposition catalyst contains at least one metal selected from the group consisting of Fe, Ni, Co, Cr, Mn, Pt, Pd, and Ru.

23 ~~22.~~ The autothermal process of claim 19 wherein the decomposition catalyst is supported on a support selected from monoliths, fiber mats, and refractory particles.

24 ~~23.~~ The autothermal process of claim ~~22~~ 23 wherein the support is comprised of a material selected from the group consisting of carbon and a metal oxide.

25 ~~24.~~ The autothermal process of claim ~~23~~ 24 wherein the support is comprised of a material selected from the group consisting of alumina, silica, silca-alumina, titania, magnesia, and aluminum metasilicates.

26 ~~25.~~ The autothermal process of claim ~~24~~ 25 wherein the support is comprised of alumina in the form of a monolith.

27 ~~26.~~ The autothermal process of claim ~~25~~ 26 wherein the monolith is in the form of a honeycomb structure comprised of a plurality of finely divided gas flow passages extending there-through.